ABSTRACT OF THE DISCLOSURE

A fuel cell system having a stack of proton exchange membrane fuel cells is operated in sub-freezing temperatures by draining any liquid water from the fuel cell water flow passages upon or after the previous shut-down of the stack before freezing can occur, and, thereafter a) starting-up the stack by directing fuel and oxidant reactants into the cell and connecting a load to the stack; b) using heat produced by the stack to increase the operating temperature of the stack to melt ice within the stack; and, c) upon the stack operating temperature reaching at least 0°C, circulating anti-freeze through stack coolers to maintain the temperature of the stack low enough to maintain a sufficiently low water vapor pressure within the cells to prevent cell dry out for at least as long as there is insufficient liquid water to circulate through the water flow passages.